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# Editorial

It was gratifying to observe the enthusiasm with which the passing of a bit of state legislation was received by the student group.

Force, the means ever used for settling conflict of ideas; of interests, was accepted as the necessary evil; the justification of the end. There were, however, those timid souls who eyed askance the antiquated political dogmatism, failing to understand in their meekness, that the human being is and has ever been subject to opinion which reaches the heights of abstraction and demands a different kind of decision. Legislation is and shall ever be a proper means for eradicating those elements which are devoid of desire for common good. But, that a group of undergraduates evince more than casual interest in a problem which is in no sense academic can only be attributed to the tolerance and subtle influence of Dean Klein, who has by word and deed held personal Character and professional Ethics above any other entity. This it was then, that surged to the top when the problem was presented to the group: no listless indifference, but, rather protest. Not for personal gain but for ethical good.

J. C. R.

# A Step Forward

E. M. Davis

Recently a group of Optometrists convened informally to discuss their profession, and ways and means of improving it. This group, meeting to further the interest of Optometry, had representation mostly from the New York Metropolitan area, as well as neighboring parts of New Jersey, Westchester County, and Connecticut. And it is not to be supposed that this is an unique occurrence, for meetings like this are being held, in a similar manner, all over the country.

What this particular conclave proposed was the publishing of a magazine, similar to periodicals of the medical profession, written for and to be distributed to the layman, to show just what Optometry is and what it is doing. Surely the time is ripe for such an organ! While the schools of Optometry are striving to give the public the type of professional man it deserves, as far as character and training are concerned, it will be a source of comfort for the student to feel that he is going out into a world that knows something of him and his equipment.

This, then, is one more worthy method of calling to the attention of the public the fact that the Optometrist of today is one who seeks, by scientific and tested methods, to aid physical well-being by endeavoring to bring about comfortable and correct vision.

## THE EXTRA-OCULAR MUSCLES

One of the most fascinating phases in the phlogenetic development of the human eye is that dealing with the origin of the six extra-ocular muscles. To the earliest students of comparative anatomy this must have been a most perplexing problem — to explain the existence of these six little striated muscles, so completely isolated from the rest of the musculature of the body. Today the solution is fairly well in hand but an adequate comprehension is utterly impossible without the advantages of diagrams, lantern slides, microscope slides, dissected specimens, and, above all, a thorough training in the biologic sciences. This hazardous presentation will then, of necessity, be as non-technical and as monosyllabic as possible.

If you have ever had the occasion (and the intestinal fortitude) to carefully examine an earthworm, you could not have failed to observe that its entire body was segmented, or *metameric* — that it was comprised of a chain of segments, essentially like one another, from one extremity to the other. In the ascent from amoeba to man, this simple but peculiar body structure makes its first appearance in the worm, or annelid, an invertebrate which, there is ample evidence to believe, was the immediate precursor of the vertebrates. Similar metameric structure is also readily observed in fishes and reptiles. A homely but striking example is the salmon we eat. From the reptiles up, through birds, mammals, etc., up to homo sapiens evidence of metamerism becomes less and less marked in the adult stage, but can be definitely seen in the embryos — a remarkable example of how ontogenesis repeats phylogenesis. Even in the *adult human* there is evidence of metamerism, e. g., the cranial and spinal nerves, the vertebrae, the ribs, the intercostal muscles, the blood vessels, et al.

Let us consider amphioxus, the lancelot, a characteristic genus of the group *Cephalochorda*. This tiny, lance-shaped fish has always been of great interest to morphologists because of its resemblance to the hypothetical ancestor of the vertebrates. This invertebrate has been proven almost beyond doubt to be the connecting link between

invertebrates and vertebrates. Its resemblance to the larva of cyclostomes, the most primitive of vertebrates, is impressive. The trunk muscles of amphioxus are arranged in an unbroken series of segments throughout its entire length. Each segment, or myotome, consists of a mass of muscle fibres extending around the sides of the body to the mid-dorsal and mid-ventral lines. *Each muscle segment, or myotome, is innervated by its own somatic motor nerve.*

But it is in the direct descendants of amphioxus, the cyclostomes, where our interest is really first aroused. In these primitive vertebrate fishes the lateral trunk muscles bear a striking resemblance to those of amphioxus, and in them, paired eyes appear for the first time, and along with these eyes, the same six muscles as in *all* vertebrates right up to man. All six muscles are derived from the first three myotomes of the cyclostome embryo and their innervation is exactly the same as that of the eye muscles of the higher vertebrates, i. e., by the 3rd, 4th, and 6th cranial nerves. The *fourth* myotome of the embryo forms the first *trunk* myotome of the adult; and so, in the cyclostome, all the embryonic myotomes persist in the adult. This is not the case in the higher vertebrates.

Now let us pass on to one of the higher vertebrates, e. g., the elasmobranchs, of which the dog-fish or shark is a characteristic species. It is in this group that the development of the eye muscles has been most thoroughly investigated. There is almost conclusive evidence to prove that the ontogenetic development of the human eye muscles is identical with that of the elasmobranch eye muscles. And briefly, this is essentially how they develop:

The three most anterior myotomes in the head region split longitudinally into dorsal and ventral halves. Each of the two divisions of the first myotome splits again lengthwise, thus making four muscles innervated by the 3rd nerve. The dorsal half of the second myotome becomes the superior oblique and is innervated by the 4th, while its ventral half unites with the third myotome to form the external rectus, innervated by the 6th. The fourth, fifth, and sixth myotomes break up into connective tissue, and so the first trunk myotome to persist in the adult is the *seventh*. Thus there is a gap left in the series of myotomes, and the six muscles are left as an abandoned group which persist only because they become functionally connected with the eyeball. It may be of interest to mention in passing that the lateral trunk myotomes give rise to the appendicular muscles.

One difficulty which has always baffled investigators, however, is the change which occurs in the nerve relations of the external rectus, which, we have seen was a derivative of the second and third myotomes. The nerve of the external rectus is *not* the trochlear which is the nerve of the second myotome, but the abducens, 6th nerve. This appears to be a case of "nerve piracy", in which the nerve of one myotome has invaded the anterior region of the head and usurped the place of another nerve. Similar cases of this sort are not uncommon. Perhaps a more serious difficulty is that the 6th nerve does not even appear to be the original nerve of the third myotome, but to be a post-otic (behind ear) nerve which has invaded pre-otic territory.

## LINES TO DR. BENCKER

*With apologies to*
Henry Wadsworth Longfellow

Lives of great men all remind us
We can make our lives sublime
And in parting leave behind us
Footprints in the sands of time —
*And on the walls of Frosh A room.*

ARTHUR F. MARCH, JR.

# Senior News

*by* FREEMAN L. RAKUSIN

The year is rapidly drawing to a close evidenced by Shepard's frantic efforts to collect class dues!! His jumping up and down has definitely eliminated Berger's strabismus!!

In a recent trip to the "Cape", Shack attempted by means of accommodative exercise to erase a feminine impression! (With the thirty-five cents he is definitely impressed!!)

Dr. Cline has a novel method of presenting stereoscopic slides by means of a slide Trombone! (He has also become quite a horticulturist as he is now attempting to cross two orange plates into a tangerine — quite a hybrid?)

Pickering has become quite a sidewalk fan, in fact the profs. would do better, according to him, if they stood in the street and lectured up to the windows!!

Malamut was a recent visitor out Dorchester way and wasn't very much the worse for wear but he definitely insisted that he wasn't the *marion* kind!

Sheinman and the writer now consider themselves as full-fledged pathologists since both have picked up cases of Follicular Conjunctivitis due to Vitamin Deficiency (we hope) under Dr. Sloan's very practical tutoring!!

Cohen just couldn't last the year out without inflicting some sort of injuries, wounds, or what have you! (According to him the worth — Black Amblyoseope slipped!!)

Obenauer saved himself just in the nick of time when on his way home his mind slipped into oblivion and he thought he was in Dr. Namias' shop; thus he began bending the handle-bars with a snipe nosed plier and wound up in Mrs. Casey's barnyard!!

The entire class thought there was a visitor present two weeks ago but on moving aside the two day growth of foliage we discovered it was only Huddy in disguise!

Pinckert surprised us all by actually arriving on time Monday after vacation, with a new suit and eager for knowledge, pathological or otherwise!!

Adelson traveled 1,000 miles and spent $15.00 on gas traveling back and forth from Holyoke to Hartford during the spring vacation!! (Quote, "She's just like an actress!") — May Robson — Hal??

Perlow is seriously contemplating writing a book on "My Experiences with the Massachusetts Police Force!" (He can't turn his car around unless he is *stared* at by some auspicious member of the force")

## PRAYER OF AN OPTOMETRIST

God grant me health, and will to pursue my work.....

God grant me clear and unerring vision in tracking down and alleviating the ills which may befall my fellow man.....

God grant me strength of spirit and singleness of purpose in my studies.....

God grant me power to follow a straight unswerving path to my goal — truth.....

God give me light that I may bring light to those in darkness.

ARTHUR F. MARCH, JR.

# Freshman Class News

As the proverb goes, "'Tis an ill wind that blows nobody good". At least it seems to hold good in this particular case, for the pain we felt at parting with Dr. Bencker has been greatly alleviated by our new (to us) instructor, Dr. Sloane. Speaking personally, I don't believe I ever learned so much, so thoroughly, in such a short space of time as I have during the few short periods that we've enjoyed Dr. Sloane's instruction. That man is a born teacher and it would certainly be a great loss to students of the eye if he were ever to abandon this field.

Evidence of his ability as a teacher is plentiful, but one outstanding example is his cognizance, and use, of the fact that we learn much more readily and quickly through our eyes than through our ears. Or perhaps a little more accurate way of putting it is that it is easier to learn from a picture or representation than from the written or spoken word.

This is a self-evident fact which, it seems to me, has not been sufficiently stressed in the field of education and one which can be both proven and explained very readily.

For proof, stop and consider how accurate a mental picture you can get from hearing or reading a description of the eyeball and its appendages, considering of course that you were previously unfamiliar with it. A small amount of it (depending on your mental ability) you can absorb and could probably transfer to paper in the form of a drawing, but as the description becomes more intricate and involved and the facts to be remembered become more numerous, your mental picture becomes more and more hazy and blurred, which means that you really have not an accurate conception of the object being described. If you cannot draw a picture of the object, not artistically but diagrammatically, then you do not thoroughly understand it, the saturation point for your particular brain has been reached. This simply means that the mass of facts presented has become too great for your brain to handle and catalogue and interpret as a definite part of the mental picture.

As for the explanation, it lies, basically, in the fact that in the scale of life the sense of sight or at least some form of light sensitiveness was present long before the ability to interpret the spoken or written word. Fundamentally we are entirely dependent on the formation of a mental picture for comprehension of a subject, and if this picture is not formed directly by the eye, then it must be formed indirectly by interpreting the words as a picture.

And that is the reason why Dr. Sloane has drawn some forty-odd diagrams on the board to illustrate his lectures. Imagine where you'd be if he had just described it all!

# Pitfalls in Clinical Practice

Dr. D. W. A. Mitchell
*Lecturer and Staff Refractionist, London Refraction Hospital*

For several years it has been my privilege to work in the clinic of the London Refraction Hospital both as a Staff Refractionist and an Instructor of students. In the course of this work I have been struck by the fact that certain details in the clinical examination of patients seem to be overlooked much more frequently than others. It may be that the students for whom this article is written are not often guilty of these same mistakes, but even if that is the case, the points I shall mention are, I think, worth reiterating, because an occasional slip or omission may have undesirable and perhaps serious consequences for both the optometrist and patient concerned.

The first step in an examination of the eyes is to investigate symptoms and history, and it is here that many make their first error. They are satisfied with a very brief and cursory enquiry. Patients rarely visit us with the prime object of buying a pair of spectacles, but to be relieved of certain symptoms. Will they have confidence in our ability to do this if we are apparently not particularly interested in these symptoms? One should learn not only why the patient came, but also how long the symptoms have been experienced, with what type of work they are associated, their frequency, severity, duration, and so on. There are many factors which may have a marked effect on the ocular functions — the general health, personal habits, working conditions (lighting, ventilation, hours), and others which will occur to you, and these should be inquired into fully. Remember that ocular discomfort, headaches, giddiness and the other symptoms which refractive errors and muscular anomalies produce may also be due to causes far removed from the eyes. No attempt is made here to give a complete list of the points which deserve attention. It is merely intended to emphasise the importance and value of this part of the examination, and to point out that for a thorough investigation of symptoms and history and an intelligent evaluation of the former a great deal of experience is necessary. It would be well for the student to study this subject from his earliest days in the clinic.

The next step is the examination for abnormal and pathological conditions and here care is necessary or some of the earliest signs and less marked changes may be overlooked. It is not possible here to discuss all the conditions which are sometimes overlooked by students, but mention of the most important of them should be useful.

One of the first points given in that section of our record card dealing with abnormal conditions is the position of the eyes, and here it is intended that in addition to differences in height, proptosis, etc., squints should be noted and their type and degree recorded. There is not much fear of squints of high degree being missed, but those of low degree can very easily be overlooked unless some form of cover test is done. My readers are no doubt familiar with this test. It should never be omitted. Failure to detect a slight squint may lead to delay and wrong conclusions later when the vision of one eye is found to remain subnormal after correction of the refractive error.

It appears that insufficient care is sometimes taken in the examination of the cornea. Very faint opacities can so easily

escape detection, but they may cause great disturbance of vision. Oblique illumination, preferably with some form of slit beam, should be used together with a corneal loupe, and later when the opthalmoscope is used the cornea should be examined again by means of transmitted light, since some opacities are more easily seen by one method than by the other. While examining the cornea by transmitted light always ask the patient to look up and examine the lower part against the red glow of the pupil. Minute spots of K.P. can often be seen in this way when they are invisible using the iris as a background, and if it is remembered that in mild cases they may be the only signs of cyclitis the importance of detecting them is obvious.

Too much stress cannot be laid on the necessity for an examination of the pupil in every case. Its size and shape should be noted and the three reflexes (the direct and indirect to light and that accompanying accommodation and convergence) should be tested, remembering that in the early stages of some pathological conditions there may not be marked miosis or mydriasis or complete immobility, but only a departure from the average size for the age and a sluggishness in the reactions.

When examining the fundus adopt some methodical and regular order for the various parts. When viewing the disc repeat to yourself the words, "Colour, size, edges, level." Never pass a case until you have seen the macular area, if this is at all possible. Note the following points with reference to the vessels: relative size of arteries to veins, swellings or constrictions along their course, tortuosity, and compression of a vein by an artery, remembering that a reduction in the size of the arteries, an uneven calibre, tortuosity of the finer twigs, and slight indentation may all be the first signs of some general disease requiring immediate medical attention. For the periphery ask the patient to look up for the upper part, to the right for the right extremity, and so on; only in this way can these important regions be seen.

In retinoscopy never be satisfied with anything but accurate results, not only because there is an examination to pass in this subject, but also because in many cases the subjective test is unreliable and every thing depends upon retinoscopy. Inaccurate results are often due to neglect of certain elementary principles which are worth repeating. The light source should be small. The observer's line of vision should almost coincide with that of the patient. The periphery of the pupil should be ignored and lenses added until the movement in the central area is neutralized, since the refraction in these areas is generally different due to spherical aberration and only the centre is used in ordinary illuminations. In some hyperopic cases in which there is a tendency to spasm the accommodation relaxes to some extent if time is given, so the test should not be rushed. Latent errors can sometimes be uncovered, partly at least, by passing from one eye to the other after the first results have been obtained and adding plus lenses as more "with" movement becomes apparent. Make yourselves expert retinoscopists — you will never regret the time spent in becoming proficient.

If retinoscopy has been done accurately the subjective test is considerably shortened. It is generally only necessary to check the axes and powers of the cylinders and modify the spheres to give best vision. Check tests should be applied, since they do not take long and slight errors may be put right which would mitigate against complete comfort if left undetected. The cross cylinder is very useful. The degree of reduction of vision produced by say a plus 1.00D sphere may indicate under-correction of hyperopia or over-correction of myopia. Make sure that the two eyes are *equally* corrected, and that a balanced prescription is given; this is generally of greater importance than a *full* correction.

Learn what vision may be expected from different degrees and types of refractive errors, and if for some reason or other it is necessary to do a subjective test without a previous retinoscopy and vision is bad you will avoid making a mistake which often wastes a great deal of valuable time — trying a weak sphere or cylinder when vision is obviously too low to be due to an error of that degree. The first lens used in the correction of the spherical or astigmatic error should be of a strength corresponding to the vision. Again, I have seen prescriptions for minus 1.50D spheres when unaided vision has been 6/18 or better. This mistake could hardly have occurred if the Refractionist had remembered that with this vision there could not be more than 1D. of myopia present.

Never omit to measure the amplitude of accommodation monocularly. Apart from the indication which may be received as to the presence of a pathological condition, this measurement is necessary to ensure that the reading addition given is suitable. In most cases it is perhaps possible to estimate the amplitude from the age, but this is unsafe because many cases are seen in which it is much higher than the figure given in the well-known tables of amplitudes, and if the usual addition for the age is given discomfort will arise and the range of clear vision will be unnecessarily curtailed. Further, unequal reading additions are required in an appreciable proportion of cases, and if these cases are not carefully treated full comfort will not be obtained.

On our record card spaces are provided for recording the muscle balance both before the subjective test and after. By comparing that without lenses (if glasses have not been worn previously) or with the old correction (if this has been worn constantly) with that obtaining with the new correction some valuable indications of the effect of the latter may be provided. If the new correction increases esophoria or changes a low exophoria to a high one suspicions are aroused; some modification is generally called for.

In a busy practice there may be a temptation to omit the near imbalance test, but this omission may be dangerous. Nowadays so much close work is done that the functioning of the eyes in near vision should receive special attention, especially as so many patients complain of discomfort with close work only. Difficulty with close work is very frequently due to some muscular trouble, and although a refractive error may be found which could itself be responsible, this does not rule out a near imbalance as a contributory or even the primary cause of the inability to perform for sustained periods tasks requiring more or less accurate adjustments of accommodation and convergence. Few tests give us more valuable information. Not only does it inform us of the state of the muscles in near vision, but by comparing it with the distance imbalance we learn something of the association between accommodation and convergence — and the longer you are in practice the more you will realize how important it is to consider this association.

Become expert in the use of the perimeter and screen. Several important diseases can be detected only by an examination of the field of vision, and it is almost if not quite as important to be proficient in this work as in opthalmoscopy. It is true that our duty does not carry us far beyond the detection of a field defect, the determination of the cause being the work of the opthalmic surgeon, but if we are to be reliable in our sphere we must know what defects to expect, just where to look for them, and so on. Learn the correct size and type of target to use in different cases. Early defects may be missed if the test object is too large.

I have a sufficiently high opinion of your colleges in America to realize that I have told you nothing which you have not heard before. I repeat that my intention was to

point out a few mistakes sometimes made by students in spite of the warnings of their instructors. I hope I may have been able to assist, though in a small way, the efforts of your teachers to make you worthy members of a profession towards the advancement of which your countrymen have contributed so much.

# Our Own and Our Cousins' Eyes

*by* Dr. Thomas Hall Shastid



(*Continued from February Issue*)

For countless ages, the horse's eyes, set out prominently on the corners of his head, have been exposed to the effulgence of the sky and the sun, and, consequently, the lower part of his retina has been completely burned out. He, on the other hand, has always been a runner and grazer, and therefore has needed to see the ground well, and, in consequence, he has developed, in the upper part of his eye-ground much the same kind of structure as the carnivora possess in the central part of their eye grounds.

There is a tapetum lucidum in every human eye, but it does not reflect much light. That structure, in our eyes, is simply the middle, or connective tissue, layer of the choroid. It possesses little metallic lustre. It is, however, that which we see chiefly when we look into the human eye with an ophthalmoscope, because the retina is transparent except for red rays. There is also, in each human eye, a tapetum nigrum. This, however, in our own eyes, is called by a different term—the *pars ciliaris retinae*. I wish I had time to talk to you about the eyes of rabbits and goats especially but I must hurry on.

### THE EYES OF PRIMATES

A few words, now, about the primates—monkeys, apes and men. The eyes of the galago (one of the lowest monkeys, or prosimiae) are very instructive indeed. These eyes have retinitis pigmentosa normally. All the symptoms are present: nyctalopia, poor vascularization of optic nerve and retina, the grains of snuff-like pigment, scattered thickest in the peripheral part of the eye-ground. The galago almost certainly occupies a conspicuous place in man's pedigree, so that it is more than likely that retinitis pigmentosa, in the human being, is simply a degeneration, or reversion to an old type of eye. I have heard ophthalmologists say that retinitis pigmentosa is almost always the result of inherited syphilis. I cannot agree, further than that I admit that, in inherited syphilis, there is a strong tendency toward reversions of various sorts. There is the same tendency in the children of consanguineous marriages, and in twins and triplets from marriages of any sort or kind.

Zoologists have found that the galago is a dark-loving animal, and that, if it be forced to dwell in strong light, its sight rapidly diminishes until, in a few years, the vision is entirely gone, whereas, if the animal be allowed to continue living in the low illumination which is normal for it, it will keep the sight with which it was born. Moved by this fact, and believing retinitis pigmentosa to be a reversion to this old type of eye, I have long caused my patients suffering from retinitis pigmentosa to avoid all strong light with the utmost care. I have also had each and all of them wear some of our modern absorptive lenses, and it has seemed to me that the progress of the disease has often been held in check by so doing. In some cases there was even a very decided improvement. I implore all ophthalmologists to keep their retinitis pigmentosa patients, in one way or another, out of strong light.

The pupils of all the primates are round. These eyes, too, are placed less laterally and more frontally than in the non-primates. There are also maculae in all these eyes, and strong muscles of accommodation. In all the monkeys, the eyes can be converged and stereoscopic vision obtained but not long maintained. In the apes, stereoscopic vision is more easily reached, and maintained with less effort. But only in man, of all the mammals, does there seem to be continuous, easily kept, binocular and stereoscopic vision. Even in the human child, however, the eyes do not, as a rule, move in perfect unison with each other till about three months after birth. That is because stereoscopic vision, in the history of life on this planet, is an extremely recent development. The same fact explains the ready loss of binocularity in many persons from errors of refraction and so forth. You will remember that, even in some of the fishes, there was some slight pupillary response to light. That is why the human infant has a good light reflex even at birth. This light reflex inheritance has come a long way, and is pretty well established.

I should add that the eye grounds of all monkeys and apes are almost exactly the same as those of the black race of mankind. There is the same dark chocolate hue of the choroid, the same shot-silk appearance of the retina, and so on.

### DOMINANCY AND SERVIENCY IN EYES

There is one peculiar thing about man's eyes that we do not find at all in the eyes of animals, namely, dominancy and serviency. Now in all mammals the eyes are *two* little cameras, not just one. In each of these cameras there is produced a tiny picture of the outer world. But, in the brain of a man, only one, single, composite or stereoscopic, picture is seen. And the peculiar thing as to the vision of a man is that to the formation of this single stereoscopic picture the two pictures, one in each eye, do not contribute equally. In a right-handed person, the right eye contributes most of the picture: in myself about ninety-five per cent. In my wife, about one hundred per cent, under all ordinary circumstances. In a left-handed person, the left eye contributes the most of the picture; generally, but not always, for, even in left-handed persons, the right eye is often dominant. In other words, the right eye is nearly always the window that the brain really looks out through, even when both eyes are directed at exactly the same object, and when the sharpness of sight of both eyes is exactly the same. The right eye gives to the brain the details of the outer world, the left eye just coming in now and then with a little accessory information as to certain matters. In some persons the left eye has no vision, when both eyes are in use, except central vision, or upper- or lower- or right- or left- half-vision. When the right eye is closed, in all these cases, then the left eye promptly extends its visual fields to the normal limits of the right eye.

I have long experimented with these matters, and hope some day to make a complete report. This is all I have to say on this subjct just now.

Dominancy and serviency in eyes, like right-handedness and left-handedness, have come into the world very late; that is, as a consequence of the evolution of a speech center. A right-handed and right-eyed person always has his speech center on the left side; and, generally, possibly always, the converse is true. In no animal, so far as I have been able to learn, is there any such thing as handedness or dominancy. This you will observe, is a peculiar state of affairs. Man did not much more than develop binocularity and stereoscopic vision than he proceeded, through the development of a speech center, to lose the stereoscopic vision very largely, though not the binocularity. This keeping of binocularity, at the same time with the steady loss of stereoscopicity, is producing in the human subject a condition which, however much it is being ignored, will eventually and necessarily result in consequences of vast importance.

### THE EYES OF BIRDS

Of the eyes of birds I have time to say little. These eyes, nevertheless, are the finest and most remarkable of all the eyes of earth. Birds' eyes are often both telescopic and microscopic. Their focusing organ is chiefly the cornea, not the lens. Their visual acuity is almost incredible, being, in some instances, one hundred times as great as that of human eyes. A bit of grain, or a tiny insect, which human eyes can barely see at a distance of one yard, these birds can see readily and distinctly at a distance of a hundred yards. We have all seen small birds, in the twilight, make a dash for an insect, apparently on a leaf or

twig more than a block away, and pick it off accurately while still flying. Swallows do this constantly by very dull evening light.

This remarkable visual acuity in birds is almost a necessity, because the sense of smell in birds is exceedingly poor, since the olfactory passages are encased in horn. Even vultures (contrary to popular supposition) do not smell their food, even though it be carrion, but see it.

Birds do not see blues and violets at all. This helps in their distance vision, because the haze which hangs about distant objects, and which, for our eyes, renders them invisible, for birds simply does not exist. Birds, on the other hand, see infra-red radiations, which, for us, affect only the temperature sense of the skin and not the retinas at all.

### INFULAE AND ACCESSORY MACULAE IN HUMAN EYES

Some birds have no macula some have a nasal macula, some a temporal and some both a nasal and a temporal. There is often an "infula", or band, of central vision, instead of a mere spot or macula. Human strabismus is sometimes due to the existence of either a secondary macula or of an infula, or band, instead of a mere spot, of central vision. We are occasionally astonished to find that a human eye which, with its full correction, can only read, say 20/50 at a distance, displays perfectly normal visual acuity at the test for near. We are accustomed to explain these cases by saying that the better vision for near is due to the pupillary contraction which occurs consensually with convergence, and, to some extent, with accommodation. This pupillary contraction, we say, has limited the vision to the most central part of the cornea, thus excluding from activity in the matter a zone of cornea which is optically very erroneous, but which, at the far point, the patient was obliged to use. This is indeed the true explanation in some cases. In other cases, the retinoscope shows no such difference between the absolutely central and the paracentral refraction. The truth is that the eye in question has, like some birds' eyes, a double macula, one for far and one for near. In a few cases there seems to be, as in other birds, an infula, or band, of sharp vision, and no macula or maculae at all.

### OTHER PECULIARITIES OF BIRDS' EYES

Nearly all birds have the eyes on the sides of the head. Such birds, of course, can have no binocular vision. Yet many possess stereoscopic vision without binocular vision. This they get by virtue of the fact that they have two maculae in each eye. This gives in the one eye the two pictures from two different angles which constitutes the *sine qua non* for stereoscopic vision. Probably the infula, or band, of central vision, accomplishes, in some birds, exactly the same thing, only in a better way.

There are no bloodvessels in any bird's retina that I have ever seen or heard of. This absence of vessels helps to sharpen the bird's sight, because bloodvessels ramifying in the very substance of the retina, as they do in our own eyes, must interfere very much with visual acuity.

Birds have voluntary control over the size of their pupils, as Casey Wood has pointed out and as anyone can see. The bird's pupils are round, whether contracted or dilated, except in a very few species, *e. g.*, the owl, which is a tree-hunter like the cat.

(*Concluded in May issue*)

* * * *

Gibbons—"The horn on your car must be broken."

Holt—"No, it's just indifferent."

Gibbons—"Indifferent! What do you mean?"

Holt—"It just doesn't give a hoot."

Teacher—Ralph, can you tell me the difference between perseverance and obstinacy?

Ralph—One is a strong will and the other is a strong won't.

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Dr. Namias—"Al, I wish you wouldn't whistle at your work."

Al Hanson—"I wasn't working, teacher; I was just whistling."

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Chevalier—"Why is your car painted black on one side and red on the other?"

P. Dexter—"Oh, it's a fine idea. You should just hear the witnesses contradicting one another!"

* * * *

Pacheco—"What makes this train so late, porter?"

Porter—"Well, yo' see, boss, dey's a train in front da's behind, an' we was behind befo' besides."

*Tough*

"Yeah, we're pretty tough in these parts, stranger. Hangin' on the tree outside is Leatherneck Joe; we got sore at him last week and hung him."

"Why don't you cut him down and bury him?"

"Bury him? Gosh, no! D'ya think we want to bury him alive?"

—*Log.*

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*And Then He Sneezed*

"Name?" queried the immigration official.

"Sneeze," replied the Chinese proudly.

The official looked hard at him. "Is that your Chinese name?" he asked.

"No, Melican name," said the Oriental blandly.

"Then let's have your native name."

"Ah Choo."

—*Log.*